



General

Guideline Title

ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group.

Bibliographic Source(s)

Bhosale PR, Atri M, Harris RD, Kang SK, Meyer BJ, Pandharipande PV, Reinhold C, Salazar GM, Shipp TD, Simpson L, Sussman BL, Uyeda J, Wall DJ, Zelop CM, Javitt MC, Glanc P, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group. Reston (VA): American College of Radiology (ACR); 2015. 13 p. [91 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Andreotti RF, Lee SI, DeJesus Allison SO, Bennett GL, Brown DL, Dubinsky T, Glanc P, Javitt MC, Mitchell DG, Podrasky AE, Shipp TD, Siegel CL, Wong-You-Cheong JJ, Zelop CM, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group. [online publication]. Reston (VA): American College of Radiology (ACR); 2011. 8 p. [51 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Clinical Condition: Acute Pelvic Pain in the Reproductive Age Group

Variant 1: Gynecological etiology suspected, serum β -hCG positive.

Radiologic Procedure	Rating	Comments	RRL*
US pelvis transvaginal	9	Both transvaginal and transabdominal US should be performed if possible.	O
US pelvis transabdominal	9	Both transvaginal and transabdominal US should be performed if possible.	O
Radiologic Procedure not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			Relative

Radiologic Procedure	Rating	Comments	RRL*
MRI pelvis without contrast	6	This procedure can be performed if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for use of contrast media.	O
MRI abdomen and pelvis without contrast	6	This procedure can be performed if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for use of contrast media.	O
MRI pelvis without and with contrast	1		O
MRI abdomen and pelvis without and with contrast	1		O
CT pelvis without contrast	1		<input type="text"/> <input type="text"/> <input type="text"/>
CT pelvis with contrast	1		<input type="text"/> <input type="text"/> <input type="text"/>
CT pelvis without and with contrast	1		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without contrast	1		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis with contrast	1		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without and with contrast	1		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Gynecological etiology suspected, serum β -hCG negative.

Radiologic Procedure	Rating	Comments	RRL*
US pelvis transvaginal	9	Both transvaginal and transabdominal US should be performed if possible.	O

US pelvis transabdominal Radiologic Procedure	9 Rating	Both transvaginal and transabdominal US should be Comments performed if possible.	0 RRL*
US duplex Doppler pelvis	9		O
MRI pelvis without and with contrast	6	This procedure can be performed if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
MRI abdomen and pelvis without and with contrast	6	This procedure can be performed if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
MRI pelvis without contrast	4	This procedure can be performed if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
MRI abdomen and pelvis without contrast	4	This procedure can be performed if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
CT abdomen and pelvis with contrast	4	This procedure can be performed if US is inconclusive or nondiagnostic and MRI is not available. See the Summary of Literature Review below for the use of contrast media.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
CT pelvis with contrast	4	This procedure can be performed if US is inconclusive or nondiagnostic and MRI is not available. In young women undergoing repeat imaging, the cumulative radiation dose should be considered. See the Summary of Literature Review below for the use of contrast media.	<input type="text"/> <input type="text"/> <input type="text"/>
CT pelvis without contrast	2	This procedure can be performed if US is inconclusive or nondiagnostic and MRI is not available. In young women undergoing repeat imaging, cumulative radiation dose should be considered.	<input type="text"/> <input type="text"/> <input type="text"/>
CT pelvis without and with contrast	2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without contrast	2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL*
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Nongynecological etiology suspected, serum β -hCG positive.

Radiologic Procedure	Rating	Comments	RRL*
US pelvis transvaginal	9	This procedure is usually performed in conjunction with transabdominal US.	O
US abdomen and pelvis transabdominal	9	Add transvaginal US as indicated.	O
US duplex Doppler adnexa	8		O
MRI abdomen and pelvis without contrast	8	See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for use of contrast media.	O
CT abdomen and pelvis with contrast	4	This procedure can be performed if US is nondiagnostic and MRI is unavailable or equivocal or for prompt diagnosis of a potentially life-threatening condition. See the Summary of Literature Review below for the use of contrast media.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
CT abdomen and pelvis without contrast	3	Literature suggests that noncontrast low-dose CT is better than US for diagnosing appendicitis, diverticulitis, enteritis, and renal calculi.	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
MRI abdomen and pelvis without and with contrast	2	See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
CT abdomen and pelvis without and with contrast	1		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Nongynecological etiology suspected, serum β -hCG negative.

Radiologic Procedure	Rating	Comments	RRL*
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Radiologic Procedure	Rating	Comments	RRL* <input type="text"/>
US abdomen and pelvis transabdominal	7	This procedure can be appropriate for suspected appendicitis and urinary tract pathology and to minimize radiation exposure.	O
US duplex Doppler pelvis	7	Doppler can be used as an adjunct to assess for appendicitis or to evaluate ureteral jets for obstructive versus nonobstructive pathology.	O
CT abdomen and pelvis without contrast	6		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
MRI abdomen and pelvis without and with contrast	6	This procedure can be used to avoid the radiation exposure of CT in a young patient or if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
MRI abdomen and pelvis without contrast	4	This procedure can be used to avoid the radiation exposure of CT in a young patient or if US is inconclusive or nondiagnostic. See the Summary of Literature Review below and <i>ACR Manual on Contrast Media</i> (see the "Availability of Companion Documents" field) for the use of contrast media.	O
US pelvis transvaginal	4		O
CT abdomen and pelvis without and with contrast	2		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Premenopausal women with acute pelvic pain often pose a diagnostic dilemma. They often exhibit nonspecific signs and symptoms, the most common being nausea, vomiting, and leukocytosis. The differential considerations encompass gynecologic and obstetrical causes (e.g., hemorrhagic ovarian cysts, pelvic inflammatory disease, ovarian torsion, ectopic pregnancy, spontaneous abortion, or labor and placental abruption), as well as nongynecologic etiologies (e.g., appendicitis, inflammatory bowel disease, infectious enteritis, diverticulitis, urinary tract calculi, pyelonephritis, and pelvic thrombophlebitis). The choice of imaging modality is determined by the most likely clinically suspected differential diagnosis. Thus, a thorough clinical evaluation of the patient is required to determine the index of suspicion among the various etiologies. Diagnostic considerations should be based upon correlation of history, physical examination, and laboratory testing before a radiologic examination is chosen.

Transvaginal (TVS) and transabdominal (TAS) pelvic sonography is the preferred imaging modality for initial assessment when an obstetrical or gynecologic etiology is suspected due to its wide availability, lack of ionizing radiation, and diagnostic versatility. Computed tomography (CT) is more useful when gastrointestinal or urinary tract pathology is likely. Magnetic resonance imaging (MRI), with its lack of ionizing radiation and excellent soft-tissue contrast, is preferred over CT for assessing the pregnant patient for nongynecologic pathologies; however, it is hampered by lack of widespread availability, especially in the acute setting.

Serum β -Human Chorionic Gonadotropin (β -hCG)

A serum β -hCG test is usually performed when a menstruating female presents with symptoms of acute pelvic pain. Knowledge of pregnancy is of utmost importance to determine whether pregnancy-related causes of pain should be considered, especially ectopic pregnancy. Concern for fetal exposure to ionizing radiation is an important consideration in triage to imaging. Serum β -hCG test becomes positive about 9 days after conception. Thus, a negative serum β -hCG test essentially excludes the diagnosis of a live intrauterine pregnancy and acute ectopic pregnancy. Some studies suggest that in a pregnant patient endometrial thickness of >21 mm virtually excludes the possibility of ectopic pregnancy. Literature from the 1980s correlated the presence of a gestational sac using TVS with β -hCG levels of 1000 to 2000 mIU/mL. The sonographic detection of a normal intrauterine pregnancy at β -hCG levels >2000 mIU/mL can be complicated by variation in operator technique or obscuration of the endometrial cavity by fibroids, hemorrhage, intrauterine devices, or vaginal bleeding.

Current studies suggest that sometimes the gestational sac may not be visible on TVS until the β -hCG level reaches 3510 mIU/mL. Therefore, in a stable patient the diagnosis of failed or ectopic pregnancy should not be made below this level, and repeat sonographic evaluation and β -hCG levels should be obtained. The absence of an intrauterine pregnancy when the β -hCG level is above the discriminatory zone of 3510 mIU/mL should be strongly suggestive of an ectopic pregnancy. The high specificity of adnexal findings suggestive of ectopic pregnancy, including the classic "tubal ring," has been widely reported in the literature. Endovaginal ultrasound (US) is currently considered the single best diagnostic modality to assess for ectopic pregnancy.

Ultrasound

Pelvic US is the initial study of choice in most reproductive-age women presenting with acute pelvic pain. TVS should be used whenever possible, although TAS is recommended when a larger field of view is desired, such as when uterine and adnexal structures are beyond the field of view of the transvaginal probe. In addition, duplex and color or power Doppler imaging can be used to characterize vascularity of the ovaries and the adnexal structures, information that may be helpful in narrowing the field of differential considerations. However, Doppler imaging should be avoided in the setting of developing intrauterine pregnancy and should be performed in a pregnant patient only when absolutely necessary.

In the evaluation of obstetrical and gynecological causes of pain, TVS may be able to differentiate findings such as hemorrhagic cyst or pelvic inflammatory disease, which are more compatible with medical management, from those that require emergency care, such as ovarian torsion (a surgical emergency) or obstetrical causes, including ectopic pregnancy or placental abruption, that may require urgent management. A hemorrhagic cyst may be hyperechoic acutely, but with hemolysis and retraction of the clot, a reticular network (sponge-like appearance) of fibrin stranding may be seen. Fluid-fluid levels between fluid components and a seemingly solid area representing retracted clot with concave outer margins may be demonstrated. Fibrin strands and a retracting clot are key observations in that they permit a confident diagnosis of hemorrhagic ovarian cysts. About 90% of hemorrhagic ovarian cysts will exhibit at least one of these two features. The specificity for diagnosis of a hemorrhagic cyst is 98.7%. Peripheral low-impedance flow without internal color Doppler signal is characteristic. Free fluid in the pelvis can be an indicator of cyst rupture. Hemoperitoneum can appear as fluid with low-level internal echoes.

Uncomplicated pelvic inflammatory disease may not be demonstrated sonographically, although early acute signs such as thickening of the fallopian tube or increased vascularity can be seen in a targeted examination. Salpingitis can present as a solid adnexal mass or a cystic paraovarian mass with a thick wall and increased vascularity. A tubo-ovarian abscess (TOA) is an inflammatory mass that involves the ovary, fallopian tube, and sometimes adjacent pelvic organs such as the bowel and bladder. Clumping of these structures together is called a tubo-ovarian complex. The sensitivity for the diagnosis of TOA by US ranges from 56% to 93%, with a specificity of 86% to 98%. The sonographic findings for TOA are nonspecific. The presence of a mass in the expected location of the ovaries or in the cul-de-sac, associated with elevated white cell count, erythrocyte sedimentation rate, and clinical suspicion, is important in making the correct diagnosis. US guidance can be used to drain a TOA and may help preserve fertility.

The most consistent finding of torsion is an enlarged edematous ovary or ovarian complex consisting of an ovary with an associated adnexal mass. One study in menarchal females suggests that an adnexal volume of <20 mL precludes torsion. Another feature suggestive of torsion is peripherally placed follicles in an enlarged ovary; however, this finding can also be seen in a polycystic ovary. Findings on Doppler vary, including absent, decreased, or reversed ovarian artery flow, and may depend on the degree of obstruction and chronicity. Lack of Doppler flow enables fairly confident diagnosis, but the presence of arterial and venous Doppler signal has been documented in one-third of cases with surgically proven torsion. More recently, a study has appeared in the literature demonstrating an abnormal flow pattern within the ovarian vein as the only Doppler finding in patients with early torsion, lending support for Doppler findings associated with the diagnosis. One study reported sensitivities and specificities for diagnosis of ovarian torsion based on the following findings: tissue edema, 21% and 100%; absence of intraovarian vascularity, 52% and 91%; absence of arterial flow, 76% and 99%; and absence or abnormal venous flow, 100% and 97%, respectively. However, the reliability of this finding needs further investigation. Other signs suggestive of ovarian torsion are the whirlpool sign and the twisted-pedicle sign.

Sonography should be considered when gastrointestinal or urinary tract pathology is suspected in pregnant patients. Despite some diagnostic limitations, sonography has the advantage over CT because the latter uses ionizing radiation. In the diagnosis of appendicitis, TAS has demonstrated variable sensitivity (67% to 100%) and specificity (83% to 96%). Unfortunately, the technique of graded compression required for this diagnosis may not be feasible in the presence of an enlarged, gravid uterus. More importantly, a normal appendix is visualized in as few as 13% to 50% of patients, even in the absence of pregnancy. As a result, a negative US examination cannot exclude the diagnosis of appendicitis. For diagnosis of obstructing ureteral calculi, a wide range of sensitivities (34% to 95%) has been reported with US. In a pregnant patient, US may not be able to differentiate physiologic hydronephrosis from obstructive hydronephrosis and may result in unnecessary surgical intervention. Early ureteral obstruction by a small calculus may not be associated with pelvocaliectasis, resulting in a false-negative examination.

Computed Tomography

CT provides the best diagnostic performance in identifying the gastrointestinal and urinary tract causes of acute pelvic pain. It shows high sensitivity (95% to 100%) and specificity (87% to 98%) in diagnosing appendicitis. CT is superior to US because it decreases the likelihood of false-negative laparotomy. Because CT almost always permits a normal appendix to be visualized, it is useful for reliably excluding the diagnosis of appendicitis. CT is also the preferred modality for detecting other bowel pathologies, such as inflammatory bowel disease, diverticulitis, and infectious enteritis or colitis. CT without intravenous contrast is more sensitive than sonography for detecting ureteral calculi, with a reported sensitivity of 96% and specificity of 93% to 98%. Low-dose noncontrast CT is routinely used in the detection of pain on the basis of suspected renal colic. If CT is to be performed, low-dose noncontrast CT for acute pelvic pain in pregnancy has been suggested to reduce radiation exposure, particularly in the second and third trimester. In children and young adults, the scanning technique can be modified to minimize the radiation dose without significantly compromising accuracy. Newer technology such as dual-energy CT has the capability to mathematically create virtually unenhanced images from contrast-enhanced images and is able to characterize the chemical composition of renal calculi. This technique can especially be used in nonpregnant patients to help in treatment planning.

For accurate diagnosis of pyelonephritis, pelvic venous thrombosis, ovarian vein thrombus, and most bowel pathologies, intravenous contrast-enhanced CT is required for optimum accuracy. For the diagnosis of acute appendicitis on CT, clinical practice is trending against the administration of enteric contrast, in particular, rectal contrast, when intravenous contrast will be administered. Two studies suggest that for diagnosis of appendicitis or other acute abdominal processes, administration of intravenous contrast alone yields similar results to administration of oral, rectal, and intravenous contrast. Another suggests that neutral versus positive oral contrast does not change the diagnostic accuracy. Although the addition of oral contrast has been shown to provide additional diagnostic confidence in a minority of patients, the routine use of oral contrast is associated with increased examination time and concerns with patient tolerance.

CT is often the first-line imaging modality in the diagnosis of abdominal pain originating from bowel, the urinary tract, or gynecologic pathology. CT findings of ovarian torsion are well documented in the literature and include a twisted vascular pedicle, thickening of the fallopian tube, smooth-walled thickening of a cystic adnexal mass, ascites, uterine deviation to the twisted side, and infiltration of adjacent pelvic fat. CT may allow better appreciation of mild inflammatory changes compared to US, with one study reporting the diagnostic accuracy of CT for acute salpingitis to be 84%. Acute pelvic pain can occur following rupture of a corpus luteal cyst or an endometrioma. The partially collapsed corpus luteal cyst has a crenulated or redundant wall on CT, whereas endometrial cysts are multilocular and usually larger compared to corpus luteal cysts.

Magnetic Resonance Imaging

MRI is a useful problem-solving tool in the evaluation of pelvic pain in pregnant women. When available, MRI is preferred to CT because it lacks ionizing radiation. In the diagnosis of appendicitis in pregnancy, MRI has high sensitivity and specificity (80% to 100% and 94% to 100%, respectively) using single-shot fast spin-echo and half-Fourier single-shot turbo spin-echo sequences. MRI can permit visualization of a normal appendix in approximately 83% to 90% of patients, and preclude negative appendectomies and may replace CT in the future. In a direct comparison of US to MRI in women suspected of appendicitis, a normal appendix was identified in 2% versus 87%, respectively.

MR urography without contrast reliably detects hydroureteronephrosis with a sensitivity and specificity of 95% and 100%, respectively, and is considered to be useful when US is nondiagnostic in pregnant patients. Obstruction secondary to urinary tract calculus can be distinguished from physiologic dilatation of pregnancy because renal enlargement and perinephric fluid from pyelosinus backflow are found only when there is pathology. However, MR lacks sensitivity for detecting small ureteral stones. False-positive findings from flow artifacts may simulate stones.

Gadolinium-based contrast agents cross the placenta; however, they have not been shown to cause any adverse effects in human fetuses when clinically recommended doses have been used. In one study, pregnant patients who received gadolinium contrast agents in the first trimester of pregnancy demonstrated no evidence of teratogenic effects in their children. Although the limited available literature suggests it is unlikely that gadolinium would have an adverse effect on fetal development, it is prudent to exercise caution and use contrast-enhanced MR imaging only when it can critically change the diagnosis. Currently there are several techniques which can evaluate the venous system in a pregnant female without intravenous contrast. MR venography can be used effectively to diagnose pelvic deep-vein thrombosis and is considered better than US. For

gynecologic pathologies, there is some evidence that MRI may be more accurate than TVS in diagnosing pelvic inflammatory disease if Doppler US is not performed. The addition of diffusion-weighted MRI to conventional MRI may improve the diagnostic accuracy for pelvic inflammatory disease. The imaging findings of ovarian torsion on CT and MRI are almost similar. CT and MRI both can show abnormal or absent ovarian enhancement along with a subacute hematoma.






Summary of Recommendations

- Acute pelvic pain in the reproductive age group presents a diagnostic challenge. US, CT, and MRI often playing an integral role in arriving at the correct diagnosis. The choice of the correct imaging test depends on the results of a careful clinical evaluation in order to narrow the differential diagnosis. Measuring the serum β -hCG level is the first step. TVS is the imaging procedure of choice to locate a pregnancy (assess the possibility of an ectopic versus intrauterine pregnancy) and the status of the fetus. TVS can sometimes distinguish malignant from benign ovarian masses and has a specificity of 98.7% in diagnosing a hemorrhagic cyst. TVS is the modality of choice in suspected pain from gynecologic origin. TVS with Doppler is useful in the diagnosis of ovarian torsion. CT performs well in the diagnosis of nongynecologic etiologies of acute pelvic pain. CT has a high sensitivity and specificity in the diagnosis of obstructive uropathy and appendicitis. CT is the preferred modality to assess diverticulitis, enteritis, and colitis. MRI can be used as a problem-solving tool in pregnant patients, and it has a high sensitivity and specificity in diagnosing appendicitis in this cohort.
- In a pregnant patient without acute signs of infection (please refer to ACR practice guidelines in pregnant patients) and with a suspected gynecologic etiology for pain, a pelvic US with adnexal Doppler would be the initial modality to assess the etiology. If the US is inconclusive, then MRI without contrast can be done for further evaluation. In a pregnant patient with suspected nongynecologic etiology for pain, US may be helpful but potentially challenging, particularly in the latter half of pregnancy. MRI is the most sensitive modality if appendicitis is suspected. The best modality to assess for renal calculi is a low-dose noncontrast CT. The addition of oral contrast to CT may help in diagnosing appendicitis, enteritis, colitis, or diverticulitis.
- In a nonpregnant patient presenting with abdominal pain and a suspected gynecologic etiology with no clinical signs of infection, US is the best initial modality. If inconclusive, the next best modality is contrast-enhanced MRI, followed by contrast-enhanced CT. If an infectious etiology is suspected, the best modality in a female of childbearing age is contrast-enhanced MRI.
- In a nonpregnant patient with pain suspected from a nongynecologic origin, a contrast-enhanced CT is the imaging modality of choice. In certain situations, dual-energy CT can be used and virtually unenhanced CT images reconstructed to assess for renal calculi. To avoid radiation exposure in a patient of childbearing age, MRI can be considered but is less sensitive for identification of small calculi with mild or early ureteral obstruction.
- The suspected etiology of the acute pelvic pain, whether it is obstetrical, gynecological, gastrointestinal, or urinary, will determine which pelvic imaging modality is the most appropriate for accurate and expeditious diagnosis and triage.

Abbreviations

- CT, computed tomography
- β -hCG, beta-human chorionic gonadotropin
- MRI, magnetic resonance imaging
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
	<0.1 mSv	<0.03 mSv
	0.1-1 mSv	0.03-0.3 mSv
	1-10 mSv	0.3-3 mSv
	10-30 mSv	3-10 mSv
	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Acute pelvic pain

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Gastroenterology

Internal Medicine

Obstetrics and Gynecology

Radiology

Urology

Intended Users

Advanced Practice Nurses

Health Plans

Hospitals

Managed Care Organizations

Physician Assistants

Physicians

Students

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of imaging modalities for differential diagnosis of acute pelvic pain in the reproductive age group

Target Population

Female patients in the reproductive age group with acute pelvic pain

Interventions and Practices Considered

1. Ultrasound (US)
 - Pelvis, transvaginal
 - Pelvis, transabdominal
 - Abdomen and pelvis, transabdominal
 - Duplex Doppler, adnexa
 - Duplex Doppler, pelvis
2. Magnetic resonance imaging (MRI)
 - Pelvis, without contrast
 - Pelvis, without and with contrast
 - Abdomen and pelvis, without contrast
 - Abdomen and pelvis, without and with contrast
3. Computed tomography (CT)
 - Pelvis, without contrast
 - Pelvis, with contrast
 - Pelvis, without and with contrast
 - Abdomen and pelvis, without contrast
 - Abdomen and pelvis, with contrast
 - Abdomen and pelvis, without and with contrast

Major Outcomes Considered

- Utility of imaging modalities in the differential diagnosis of acute pelvic pain
- Sensitivity and specificity of imaging modalities in the differential diagnosis of acute pelvic pain

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Summary

Of the 41 citations in the original bibliography, 37 were retained in the final document. Articles were removed from the original bibliography if they were more than 10 years old and did not contribute to the evidence or they were no longer cited in the revised narrative text.

A new literature search was conducted in December 2013 to identify additional evidence published since the *ACR Appropriateness Criteria® Acute Pelvic Pain in the Reproductive Age Group* topic was finalized. Using the search strategy described in the literature search companion (see the "Availability of Companion Documents" field), 36 articles were found. Seven articles were added to the bibliography. Twenty-nine articles were not used due to either poor study design, the articles were not relevant or generalizable to the topic, the results were unclear, misinterpreted, or biased, or the articles were already cited in the original bibliography.

The author added 43 citations from bibliographies, Web sites, or books that were not found in the new literature search.

Four citations are supporting documents that were added by staff.

See also the American College of Radiology (ACR) Appropriateness Criteria® literature search process document (see the "Availability of Companion Documents" field) for further information.

Number of Source Documents

Of the 41 citations in the original bibliography, 37 were retained in the final document. The new literature search conducted in December 2013 identified 7 articles that were added to the bibliography. The author added 43 citations from bibliographies, Web sites, or books that were not found in the new literature search. Four citations are supporting documents that were added by staff.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Definitions of Study Quality Categories

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - The study has important study design limitations.

Category 4 - The study or source is not useful as primary evidence. The article may not be a clinical study, the study design is invalid, or conclusions are based on expert consensus.

The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);

Or

The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;

Or

The study is an expert opinion or consensus document.

Category M - Meta-analysis studies are not rated for study quality using the study element method because the method is designed to evaluate individual studies only. An "M" for the study quality will indicate that the study quality has not been evaluated for the meta-analysis study.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author assesses the literature then drafts or revises the narrative summarizing the evidence found in the literature. American College of Radiology (ACR) staff drafts an evidence table based on the analysis of the selected literature. These tables rate the study quality for each article included in the narrative.

The expert panel reviews the narrative, evidence table and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the variant table(s). Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Rating Appropriateness

The American College of Radiology (ACR) Appropriateness Criteria (AC) methodology is based on the RAND/UCLA Appropriateness Method. The appropriateness ratings for each of the procedures or treatments included in the AC topics are determined using a modified Delphi method. An initial survey is conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. The expert panel members review the evidence presented and assess the risks or harms of doing the procedure balanced with the benefits of performing the procedure. The direct or indirect costs of a procedure are not considered as a risk or harm when determining appropriateness (additional assumptions regarding rating appropriateness can be found in the document [Rating Round Information](#)). When the evidence for a specific topic and variant is uncertain or incomplete, expert opinion may supplement the available evidence or may be the sole source for assessing the appropriateness.

The appropriateness is represented on an ordinal scale that uses integers from 1 to 9 grouped into three categories: 1, 2, or 3 are in the category "usually not appropriate" where the harms of doing the procedure outweigh the benefits; and 7, 8, or 9 are in the category "usually appropriate" where the benefits of doing a procedure outweigh the harms or risks. The middle category, designated "may be appropriate," is represented by 4, 5, or 6 on the scale. The middle category is when the risks and benefits are equivocal or unclear, the dispersion of the individual ratings from the group median rating is too large (i.e., disagreement), the evidence is contradictory or unclear, or there are special circumstances or subpopulations which could influence the risks or benefits that are embedded in the variant.

The ratings assigned by each panel member are presented in a table displaying the frequency distribution of the ratings without identifying which members provided any particular rating. To determine the panel's recommendation, the rating category that contains the median group rating without disagreement is selected. This may be determined after either the first or second rating round. If there is disagreement after the first rating round, a conference call is scheduled to discuss the evidence and, if needed, clarify the variant or procedure description. If there is still disagreement after the second rating round, the recommendation is "may be appropriate."

This modified Delphi method enables each panelist to articulate his or her individual interpretations of the evidence or expert opinion without excessive influence from fellow panelists in a simple, standardized, and economical process. For additional information on the ratings process see the [Rating Round Information](#) document.

Additional methodology documents, including a more detailed explanation of the complete topic development process and all ACR AC topics can be found on the [ACR Web site](#) (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria (AC).

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current medical evidence literature and the application of the RAND/UCLA appropriateness method and expert panel consensus.

Summary of Evidence

Of the 91 references cited in the *ACR Appropriateness Criteria® Acute Pelvic Pain in the Reproductive Age Group* document, 87 are categorized as diagnostic references including 6 well designed studies, 10 good quality studies, and 32 quality studies that may have design limitations. Additionally, 1 reference is categorized as a good quality therapeutic study. There are 39 references that may not be useful as primary evidence. There are 3 references that are meta-analysis studies.

While there are references that report on studies with design limitations, 17 well designed or good quality studies provide good evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate selection of radiologic imaging procedures to evaluate female patients in the reproductive age group with acute pelvic pain

Potential Harms

- In a pregnant patient, ultrasound (US) may not be able to differentiate physiologic hydronephrosis from obstructive hydronephrosis and may result in unnecessary surgical intervention. Early ureteral obstruction by a small calculus may not be associated with pelvocaliectasis, resulting in a false-negative examination.
- Magnetic resonance (MR) lacks sensitivity for detecting small ureteral stones. False-positive findings from flow artifacts may simulate stones.
- Although the limited available literature suggests it is unlikely that gadolinium would have an adverse effect on fetal development, it is prudent to exercise caution and use contrast-enhanced MR imaging only when it can critically change the diagnosis.

Refer to the "Safety Considerations in Pregnant Patients" section of the original guideline document for a list of American College of Radiology (ACR) documents regarding imaging of pregnant women.

Relative Radiation Level

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

- The American College of Radiology (ACR) Committee on Appropriateness Criteria (AC) and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.
- ACR seeks and encourages collaboration with other organizations on the development of the ACR AC through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply individual or society endorsement of the final document.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Safety

Identifying Information and Availability

Bibliographic Source(s)

Bhosale PR, Atri M, Harris RD, Kang SK, Meyer BJ, Pandharipande PV, Reinhold C, Salazar GM, Shipp TD, Simpson L, Sussman BL, Uyeda J, Wall DJ, Zelop CM, Javitt MC, Glanc P, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group. Reston (VA): American College of Radiology (ACR); 2015. 13 p. [91 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2015

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Women's Imaging

Composition of Group That Authored the Guideline

Panel Members: Priyadarshani R. Bhosale, MD (*Principal Author*); Mostafa Atri, MD; Robert D. Harris, MD, MPH; Stella K. Kang, MD, MS; Benjamin J. Meyer, MD; Pari V. Pandharipande, MD, MPH; Caroline Reinhold, MD; Gloria M. Salazar, MD; Thomas D. Shipp, MD, RDMS; Lynn Simpson, MD; Betsy L. Sussman, MD; Jennifer Uyeda, MD; Darci J. Wall, MD; Carolyn M. Zelop, MD; Marcia C. Javitt, MD (*Specialty Chair*); Phyllis Glanc, MD (*Panel Chair*)

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Andreotti RF, Lee SI, DeJesus Allison SO, Bennett GL, Brown DL, Dubinsky T, Glanc P, Javitt MC, Mitchell DG, Podrasky AE, Shipp TD, Siegel CL, Wong-You-Cheong JJ, Zelop CM, Expert Panel on Women's Imaging. ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group. [online publication]. Reston (VA): American College of Radiology (ACR); 2011. 8 p. [51 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the [American College of Radiology \(ACR\) Web site](#) .

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2015 Oct. 3 p. Available from the [American College of Radiology \(ACR\) Web site](#) .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2015 Feb. 1 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development. Reston (VA): American College of Radiology; 2015 Nov. 5 p. Available

from the [ACR Web site](#) .

- ACR Appropriateness Criteria®. Topic development process. Reston (VA): American College of Radiology; 2015 Nov. 2 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Rating round information. Reston (VA): American College of Radiology; 2015 Apr. 5 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2015 Sep. 3 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2015 Jul; 2 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 2015; 129 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group. Evidence table. Reston (VA): American College of Radiology; 2015. 26 p. Available from the [ACR Web site](#) .
- ACR Appropriateness Criteria® acute pelvic pain in the reproductive age group. Literature search. Reston (VA): American College of Radiology; 2015. 1 p. Available from the [ACR Web site](#) .

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI Institute on June 14, 2010. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This summary was updated by ECRI Institute on August 30, 2011. This summary was updated by ECRI Institute on February 12, 2016.

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